LOT 5 FOX-MILLER PROPERTY

2009 ANNUAL REPORT

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Lot 5 Fox-Miller Property
2009 Annual Report

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1.0 INTRODUCTION

This annual report summarizes the biological monitoring of the restoration and open space areas of the Lot 5 Fox-Miller project located in Carlsbad, California. This report was prepared in compliance with monitoring program requirements described in the project's Habitat Restoration and Mitigation Plan (Restoration Plan; RECON 2005).

1.1 PROJECT LOCATION

The restoration project is located north of Palomar Airport Road, east of El Camino Real, and between Faraday Avenue and College Boulevard in the City of Carlsbad, California (Figures 1 and 2). Habitat restoration is occurring within a 7.44-acre portion of an on-site preserve area.

1.2 MITIGATION REQUIREMENTS

Project impacts to approximately 2.66 acres of Diegan coastal sage scrub (DCSS) were mitigated at a 2:1 ratio, which included on-site preservation of 2.9 acres, on-site restoration/conversion of 1.80 acres of non-native grassland to DCSS, and on-site revegetation of 0.62 acre of DCSS on manufactured slopes. A total of 2.42 acres of DCSS restoration is occurring on site.

Impacts to 0.36 acre of native grassland (NG) were mitigated at a 3:1 ratio, which included on-site preservation of 0.07 acre of NG and on-site restoration/conversion of 1.01 acres of non-native grassland to NG. Impacts to 30.23 acres of non-native grassland were mitigated at a 0.5:1 ratio, which included on-site preservation of 11.41 acres of non-native grassland and restoration/conversion of 3.71 acres of non-native grassland to NG. A total of 4.72 acres of non-native grassland are being restored/converted to NG.

Impacts to 0.11 acre of thread-leaved brodiaea (*Brodiaea filifolia*) habitat were mitigated through on-site preservation of approximately 95 percent (2.05 acres) of the thread-leaved brodiaea population and translocation of the remaining 5 percent (0.11 acre) of the population from areas that would be impacted to the NG restoration area on site.

The project impacted 0.22 acre of habitat under the jurisdiction of U.S. Army Corps of Engineers (Corps) and California Department of Fish and Game (CDFG) jurisdictional waters. Impacts to 0.03 acre of disturbed wetland habitat (i.e., tamarisk scrub) were mitigated at a 2:1 ratio and impacts to 0.19 acre of non-wetland Waters of the U.S/streambed habitat were mitigated at a 1:1 ratio. Mitigation requirements include purchase of 0.22 acre of wetland mitigation credits from the off-site Pilgrim Creek Mitigation Bank and on-site creation of 0.30 acre of southern willow scrub (SWS) habitat, in accordance with the Corps Nationwide Permit (Permit # 200301550-SMJ), the Regional Water Quality Control Board's 401 Certification (File # 04C-028), and the CDFG's Streambed Alteration Agreement (# 1600-2004-0084-R5). The SWS creation area on site is approximately 0.27 acre, which is smaller than the 0.30-acre area listed in the permits, but does fulfill the mitigation ratio requirements for jurisdictional impacts.

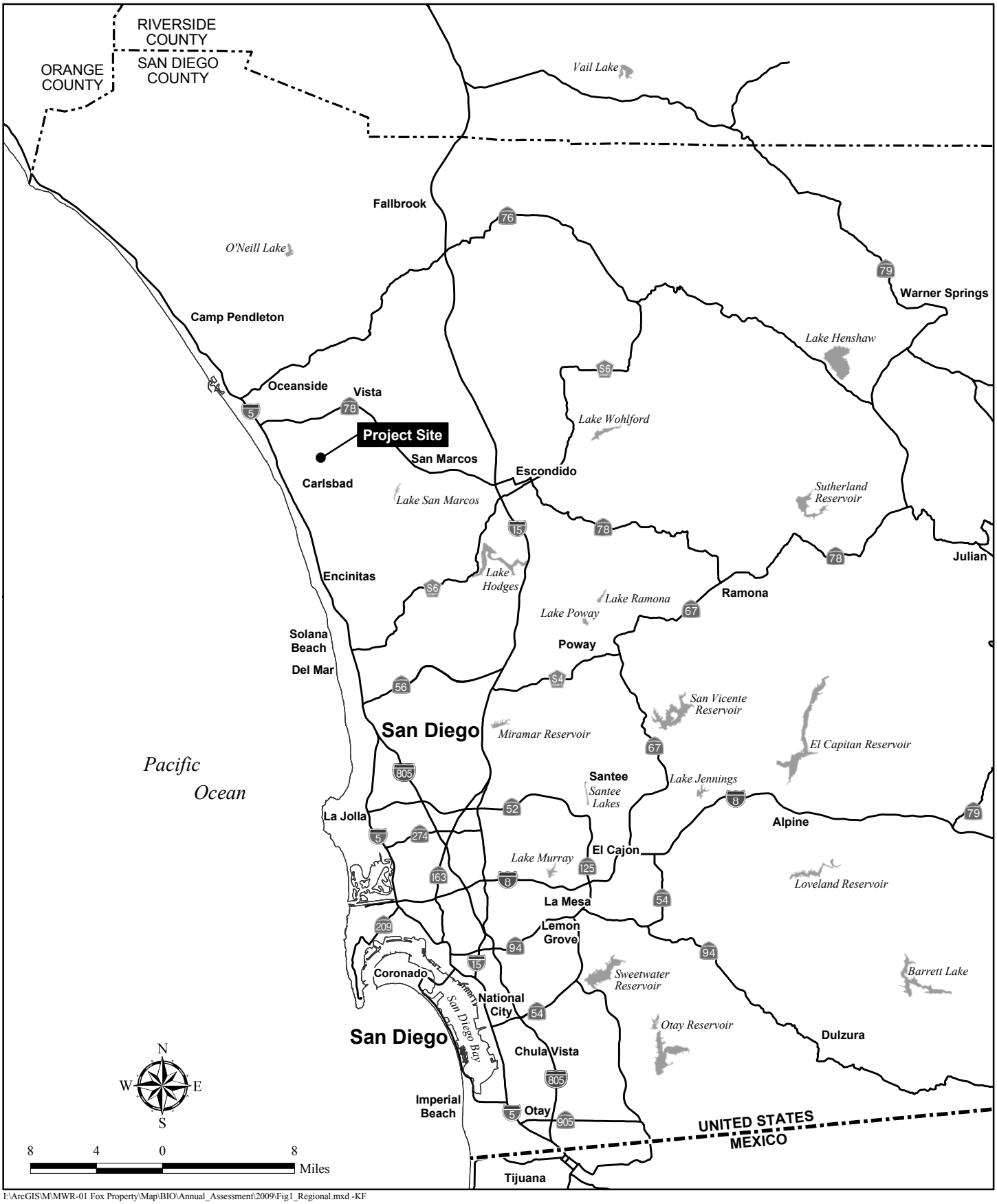
1.3 INSTALLATION

Thread-leaved brodiaea located in the project footprint were salvaged in 2006 using the cut-block method (Table 1; RECON 2008). The SWS creation area (Figure 3) was installed in February 2007 (Table 1; RECON 2007a). The DCSS, NG, and SWS restoration areas (Figure 3) were installed in spring 2007 (Table 1; RECON 2007b). A summary of the installation is provided in Table 1.

Supplemental installation during the current year included installation of irrigation on portions of the DCSS slopes and installation of container stock and seeding of the NG, DCSS, and SWS restoration areas (Table 1).

Table 1
INSTALLATION SUMMARY

Date	Activity
January 2006	Brodiaea salvaged from development footprint (cut-block method).
February 2007	Planting of 0.25-acre SWS creation area was completed.
March 2007	Planting of the 4.72-acre NG restoration area was completed.
April 2007	Planting of the 2.42-acre of DCSS restoration areas were completed.
January 21, 2009	Seeded NG restoration area with a 33.04 lb. mixture consisting of purple needlegrass (*Nassella pulchra*) and small flowered needlegrass (*Nassella lepida*).
April 21- May 14, 2009	Planted 1,309 1-gallon container stock in DCSS restoration areas.
May 7, 2009	Irrigation installation completed
July 15-16, 2009	Seeded DCSS restoration areas with 16.64 lbs of native seed.
July 16, 2009	Seeded SWS restoration area with 3.93 lbs. of native seed.
September 8, 2009	Installed container stock consisting of 30 salt grass (*Distichlis spicata*), 30 sandbar willow (*Salix exigua*), and 10 mule flat (*Baccharis salicifolia*) specimens in the SWS restoration area.
October 9, 2009	Installed container stock consisting of 30 black willow (*Salix gooddingii*), 30 sandbar willow, and 60 mule flat specimens in the SWS restoration area.
October 9, 2009	Installed container stock consisting of 45 California sagebrush (*Artemisia californica*), 10 laurel sumac (*Malosma lauriana*), 30 California encelia (*Encelia californica*), 5 white sage (*Salvias apiana*), and 20 black sage (*Salvia mellifera*) specimens in the DCSS restoration areas.
October 12-16, 2009	Installed container stock consisting of 1,305 purple needlegrass in the NG restoration area.



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Regional Location Map

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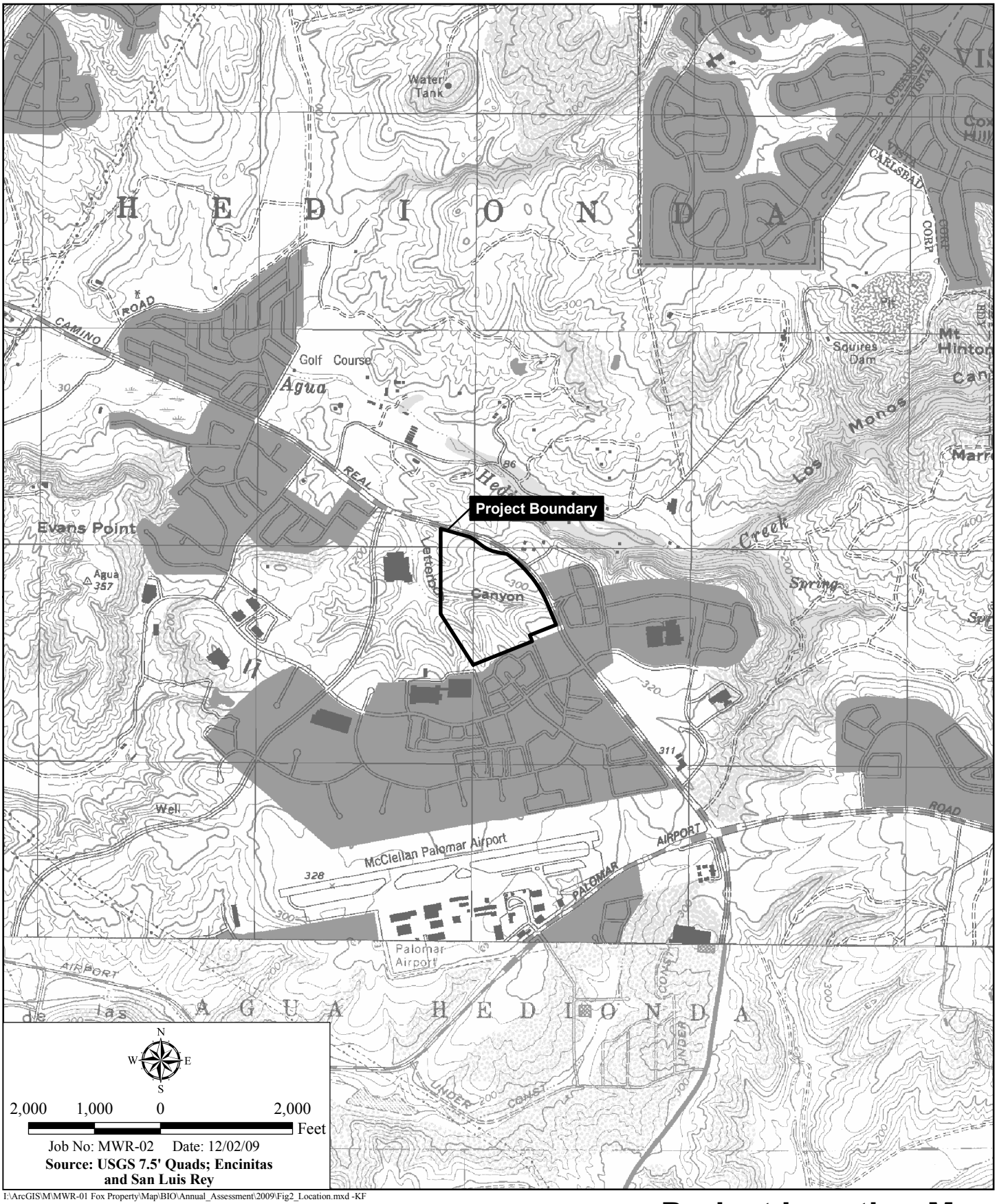
Figure 1



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Project Location Map

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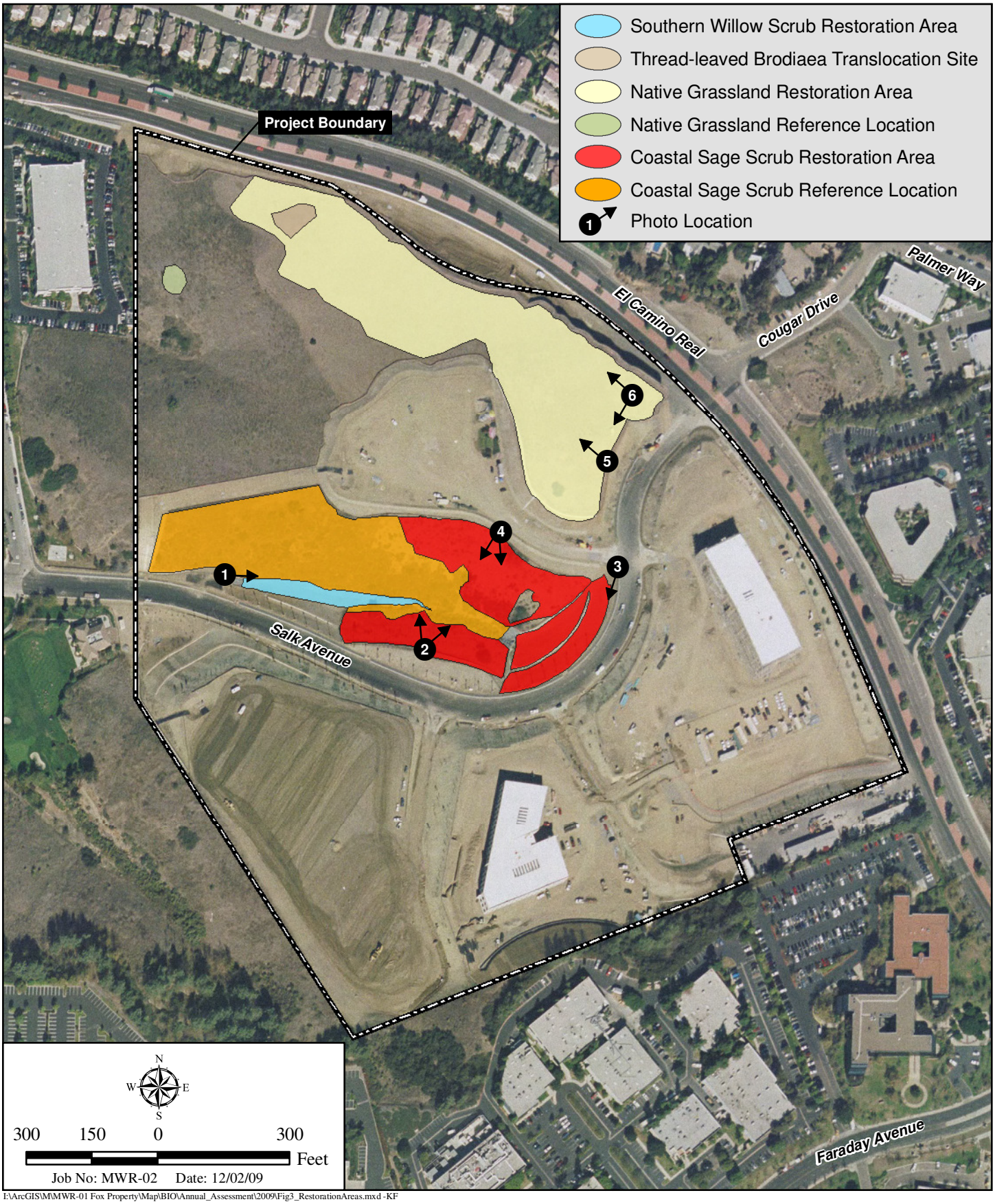
Figure 2



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Restoration Areas

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Figure 3

2.0 METHODS

Restoration activities during the thread-leaved brodiaea soil salvage, restoration installation, and Year 1 of the 5-year restoration project were completed by RECON. HELIX Environmental Planning, Inc. (HELIX) took over responsibility of monitoring and HELIX Environmental Construction Group (HECG) took over maintenance responsibilities for the project during Year 2 (May 2008).

After installation, the restoration effort consists of (1) site maintenance; (2) regular monitoring to direct maintenance activities; and (3) annual monitoring to assess the progress of the restoration effort toward achieving final mitigation goals. Site maintenance is performed by a maintenance contractor and typically conducted more frequently in the first few years of restoration when non-native plant control is a major issue. Maintenance monitoring relies on visual observations of the site, plant health, etc. It is conducted frequently during the first few years of the restoration effort and less frequently toward the end of the maintenance and monitoring period as the site becomes more established. Annual monitoring consists of visual observations during the first 2 years of restoration, and quantitative measurements during the remainder of the 5-year maintenance and monitoring period. One annual report is produced for each of the 5 years of monitoring.

Nomenclature used in this report follows these conventions: vegetation community classifications follow Holland (1986); plants named in this report were identified according to The Jepson Manual, Higher Plants of California (Hickman 1993); and sensitive species status follows the CDFG (2008) and the U.S. Fish and Wildlife Service (USFWS; 2007).

2.1 MAINTENANCE

HECG performed routine (monthly) maintenance. Work conducted by HECG includes weed management, trash removal, and supplemental planting and seeding of the restoration areas. HECG also managed invasive weed species within the open space on site (monthly weeding).

2.2 MAINTENANCE MONITORING

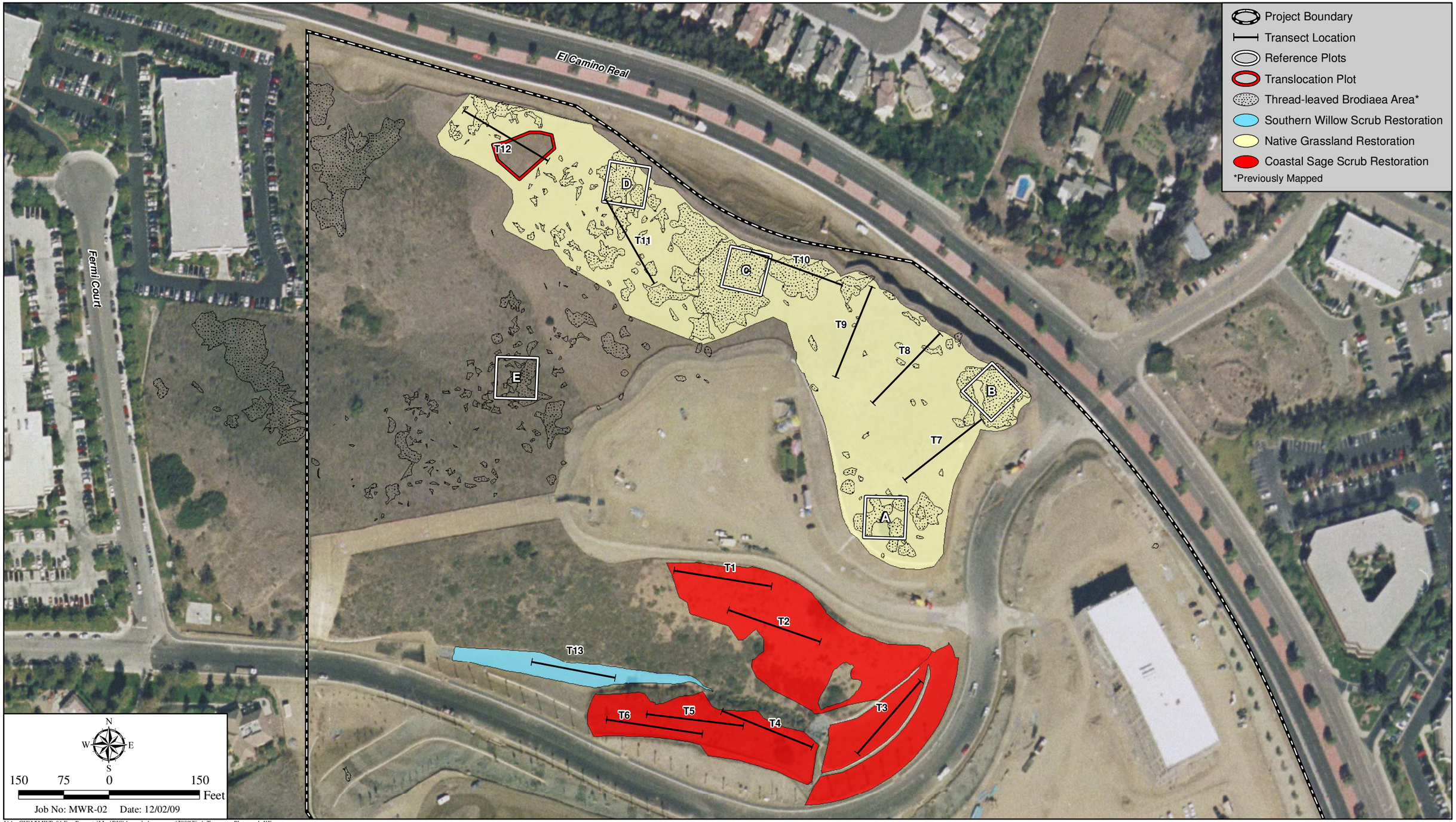
Monthly maintenance monitoring visits have been conducted by HELIX biologists in 2009 (Table 2). During each visit, a biologist evaluates the site condition and advises maintenance personnel of any items in need of attention.

2.3 ANNUAL TECHNICAL MONITORING

Data collected during the annual monitoring events are used to determine if the project has met success criteria for the given year. For Years 1 and 2, annual monitoring consists of qualitative analysis of overall site conditions, including observations of plant health, observations of plant recruitment (i.e., the successful, natural reproduction and/or establishment of plants in a given area), and general use of the area by wildlife along with photographic documentation of the site. For Years 3 through 5, technical monitoring of the DCSS, NG, and SWS restoration areas consists of a qualitative analysis of overall site conditions and quantitative measurements of species diversity (richness and composition) and vegetative cover using point intercept line and belt-transect sampling methods (described below). Annual monitoring of the thread-leaved brodiaea translocation plot and 5 reference plots consists of quantitative counts of flowering individuals throughout the blooming period.

Table 2 2009 SITE VISITS		
DATE	**PERSONNEL**	**PURPOSE OF VISIT**
January 9, 2009	Jason Kurnow	Maintenance monitoring
January 15, 2009	Jason Kurnow	Staked NG/Open Space boundary. Flagged thread-leaved brodiaea within NG
January 26, 2009	Jason Kurnow	Supervised herbicide application (no herbicide was used within 10 feet of any thread-leaved brodiaea)
February 26, 2009	Jason Kurnow	Maintenance monitoring
March 3, 2009	Jason Kurnow	Maintenance monitoring
March 25, 2009	Larry Sward Amy Mattson	Site visit to check for flowering thread-leaved brodiaea
April 29, 2009	Jason Kurnow	Maintenance monitoring
May 4, 2009	Jason Kurnow	Flagged polygons within NG that will be planted with 1-gallon native grass container stock; supervised weeding activities
May 5, 2009	Jason Kurnow Dale Ritenour Shelby Howard	NG/DCSS annual assessment, thread-leaved brodiaea plot counts, and on-site meeting with CDFG and USFWS
May 11, 2009	Jason Kurnow	NG/DCSS annual assessment and thread-leaved brodiaea plot counts
May 19, 2009	Jason Kurnow	Maintenance monitoring and thread-leaved brodiaea plot counts
May 28, 2009	Shelby Howard Justin Fischbeck	Follow-up meeting with USFWS.
June 1, 2009	Jason Kurnow	Thread-leaved brodiaea plot counts
June 9, 2009	Jason Kurnow	Maintenance monitoring
July 13, 2009	Shelby Howard	Site meeting with maintenance personnel
July 14, 2009	Larry Sward	Maintenance monitoring
August 17, 2009	Jason Kurnow	Maintenance monitoring
September 14, 2009	Jason Kurnow	Maintenance monitoring and SWS annual assessment.
October 11, 2009	Amy Mattson Jasmine Watts	Evaluate status of native grass planting within NG
October 28, 2009	Shelby Howard	Site meeting with maintenance personnel
November 16, 2009	Jason Kurnow	Maintenance monitoring

Thirteen (13) permanent transects were established during the Year 3 technical monitoring. Vegetation data were collected from 13 line transects: Transects 1 to 6 are located in the DCSS restoration area, Transects 7 to12 are located in the NG restoration area, and Transect 13 is located in the SWS restoration area (Figure 4). The 2 ends of each line transect were permanently marked with a rebar stake covered with white PVC pipe. Transect lengths are



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Transect and Plot Locations

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Figure 4

50 meters (m) and centered on a 50 m by 5 m plot (250 m^2), as specified by the California Native Plant Society (1996). Monitoring consisted of point intercept (line transect) sampling methods. At every 50 centimeters (cm) along each transect (beginning at the 50-cm mark and ending at 50 m), a point was projected into the vegetation, and species intercepted by the point were recorded. Vegetation intercepts were categorized into herb (less than 60 cm), shrub (60 to 200 cm), and tree (greater than 200 cm) layers. Total cover is the percentage of points along the transect that are intercepted by vegetation. A single point may be intercepted by plants in multiple layers but would be counted only as a single point for total cover. Percent cover for herb, shrub, and tree categories were calculated for both native and non-native species.

HELIX biologists Jason Kurnow and Dale Ritenour conducted the 2009 annual assessment for the NG and DCSS restoration areas on May 5 and May 11, 2009. This time period represents the peak time period for detected annual plant species. The SWS annual assessment was conducted by Mr. Kurnow on September 14, 2009 (near the end of the growing season for wetland plants). Data from the SWS annual assessment were compared against a reference site. No SWS habitat occurs on site or immediately adjacent to the site; therefore, a reference transect from one of HELIX's nearby projects (Carlsbad Raceway) was used as the reference transect for this project. The reference site is a 25-m transect along an unnamed tributary to Agua Hedionda Creek (approximately 2 miles to the east of the Fox-Miller site).

Counts of the number of flowering thread-leaved brodiaea within the translocation plot and the 5 reference plots (Figure 4) were conducted by Mr. Kurnow on May 5, 11, and 19, 2009, and June 1, 2009. Mr. Ritenour assisted Mr. Kurnow with the plot counts on May 5, 2009. Reference plots are the same size as the translocation plot. Data was collected on 4 separate occasions within the blooming period, and data collection occurred the same day for each plot. A GPS unit with sub-meter accuracy was used to record the number of flowering individuals per plot. Data within each plot was overlaid and individuals that were recorded multiple times were not double counted in the analysis below.

Six photo locations were established throughout the restoration areas during the 2009 annual monitoring visits (Figure 3; Appendix A). An additional 19 photo points were established during the 2009 annual assessment. A photo of each of the 13 transects was taken near each 0-m marker facing the opposite 50-m marker and a photo of each of the 6 thread-leaved brodiaea plots was taken. A list of all plant species within each 250-m^2 belt transect was compiled and is presented as Appendix B, and a list of animal species detected within the site is presented as Appendix C.

3.0 SUCCESS CRITERIA

Success criteria for the thread-leaved brodiaea/DCSS/NG/SWS restoration areas outlined in this report are specified in the Restoration Plan (RECON 2005). Success criteria are intended to help determine the successful completion of the 5-year mitigation and monitoring program. Attainment of the success criteria indicates that the restoration is progressing toward the desired habitat function and services. Under the project's Restoration Plan, native cover and species diversity (the number of species in an area) success criteria for DCSS, NG, and SWS are based on reference areas located within the open space easement. Non-native species cover and target weed species cover are based on absolute cover criteria and are not relevant to a reference area.

Species diversity and native species cover are expected to increase annually as the habitat within each restoration area grows and matures. Non-native plant species are typically a problem within habitat restoration, particularly at the beginning of a restoration project. With continued maintenance and as native habitat develops, non-native species become less problematic.

If project success criteria are not being met, corrective measures will be taken. This could include additional planting/seeding, increased maintenance efforts, change in approach to the treatment of non-native species, installation of irrigation, and any changes to irrigation schedules if irrigation is installed.

3.1 THREAD-LEAVED BRODIAEA

At the end of the 5-year monitoring period, the translocation area should exceed the number of thread-leaved brodiaea impacted (relocated) by the construction project. There are no specific cover or species richness criteria for thread-leaved brodiaea; however, the Restoration Plan states that the following criterion must be met in order for the brodiaea restoration project to be successful:

- The relocated population must exhibit similar patterns to that of the reference populations, which are of similar size.

To measure this, 5 populations of similar size and density are to be selected from the open space. The total number of flowering plants within each of these will be counted each year and compared to the translocated population.

3.2 DIEGAN COASTAL SAGE SCRUB

The restoration area should support 2.42 acres of viable DCSS habitat at the end of the 5-year monitoring period. Specific success criteria for species diversity, native species cover, non-native species cover, and target non-native species cover were established in the Restoration Plan and are presented below (Table 3).

Table 3
DIEGAN COASTAL SAGE SCRUB SUCCESS CRITERIA MILESTONES

CRITERIA	YEAR				
	1	2	3	4	5
Minimum species diversity*	--	50%	70%	80%	80%
Minimum percent native species cover *	--	25%	40%	60%	75%
Maximum percent non-native species cover	5%	5%	5%	5%	5%
Maximum percent target weed species cover†	0%	0%	0%	0%	0%

*Relative to a reference site

†Target weed species are those listed on the California Invasive Plant Council (Cal-IPC) list of "Exotic Pest Plants of Greatest Ecological Concern" (2006), with the exception of brome grasses

For Year 3, the DCSS restoration area is expected to have species diversity equal to 70 percent of the reference area and native cover equal to at least 40 percent of the reference area (Table 3). Species diversity is the number of species in a given area. The Restoration Plan also requires non-native species to comprise less than 5 percent absolute cover in the restoration area and that there be no target weed species (Table 3).

3.3 NATIVE GRASSLAND

The restoration area should support 1.01 acres of viable NG habitat at the end of the 5-year monitoring period. Specific success criteria for species diversity, native species cover, non-native species cover, and target non-native species cover were established in the Restoration Plan and are presented below (Table 4).

Table 4
NATIVE GRASSLAND SUCCESS CRITERIA MILESTONES

CRITERIA	YEAR				
	1	2	3	4	5
Minimum species diversity*	40%	50%	70%	80%	80%
Minimum percent native species cover*	15%	25%	40%	50%	60%
Maximum percent non-native species cover	5%	5%	5%	5%	5%
Maximum percent target weed species cover†	0%	0%	0%	0%	0%

*Relative to a reference site

†Target weed species are those listed on the Cal-IPC list of "Exotic Pest Plants of Greatest Ecological Concern" (2006), with the exception of brome grasses

For Year 3, the NG restoration area is expected to have species diversity equal to 70 percent of the reference area and native cover equal to at least 40 percent of the reference area. Species diversity is the number of species in a given area. The Restoration Plan also requires non-native species to comprise less than 5 percent absolute cover in the restoration area and that there be no target weed species (Table 4).

3.4 SOUTHERN WILLOW SCRUB

The restoration area should support 0.25 acre of viable SWS habitat at the end of the 5-year monitoring period. Specific success criteria for species diversity, native species cover, non-native species cover, and target non-native species cover were established in the Restoration Plan and are presented below (Table 5).

Table 5 SOUTHERN WILLOW SCRUB SUCCESS CRITERIA MILESTONES					
CRITERIA	**YEAR**				
	1	**2**	**3**	**4**	**5**
Minimum species diversity*	---	50%	70%	80%	80%
Minimum percent native species cover*	---	40%	75%	80%	90%
Maximum percent non-native species cover	5%	5%	5%	5%	5%
Maximum percent target weed species cover†	0%	0%	0%	0%	0%

*Relative to a reference site

†Target weed species are those listed on the Cal-IPC list of "Exotic Pest Plants of Greatest Ecological Concern" (2006), with the exception of brome grasses

For Year 3, the NG restoration area is expected to have species diversity equal to 70 percent of the reference area and native cover equal to at least 75 percent of the reference area. Species diversity is the number of species in a given area. The Restoration Plan also requires non-native species to comprise less than 5 percent absolute cover in the restoration area and that there be no target weed species (Table 5).

4.0 RESULTS

The 2009 annual assessment results are described in detail below for thread-leaved brodiaea and for DCSS, NG, and SWS habitats.

4.1 MAINTENANCE

HECG has performed routine (monthly) maintenance and conducted additional planting/seeding in NG, DCSS, and SWS restoration areas (Table 1).

4.2 MAINTENANCE MONITORING

This section details the qualitative results of the entire 2009 monitoring period for thread-leaved brodiaea/DCSS/NG/SWS.

4.2.1 Thread-leaved Brodiaea

Non-flowering thread-leaved brodiaea was first observed in late January 2009 throughout the NG restoration area. The number of leafing individuals peaked in February-March and the locations observed were similar to that noted in the Restoration Plan. The first flowering individual was observed April 23, 2009. At this time, only 1 individual was observed. The peak of the blooming period occurred mid-May, with flowering individuals found in low to moderate densities throughout the NG. By July 1, 2009, the blooming period had ended. Quantities of flowering individuals were significantly lower than non-flowering individuals, which is typical for this species.

4.2.2 Diegan Coastal Sage Scrub

Established plants (those planted prior to 2009) have high survivorship, with minimal new growth. Plant density increased in mid-May 2009 as a result of HECG planting 1,309 one-gallon container stock on the northern and southern slopes. Many of these plantings continue to do well, with minimal mortality observed. Recruitment remains very low. Non-native plant species cover was generally low throughout 2009, but peaked several times in response to rainfall. Maintenance personnel were directed to treat and remove weeds prior to them setting seed.

Ornamental rosemary (*Rosmarinus* sp.) plants along the DCSS restoration area/parking lot interface were removed over the summer and replacement DCSS container stock was planted in those locations.

A coastal California gnatcatcher (*Polioptila californica californica*) was documented in the northern DCSS restoration area on July 13, 2009.

4.2.3 Native Grassland

Native cover fluctuated throughout the year, since most of the cover comes from annual species. Cover was minimal in January, increasing steadily into March. This coincided with the germination of thread-leaved brodiaea and bluedicks (*Dichelostemma capitatum*). Cover then decreased prior to the thread-leaved brodiaea blooming period, which peaked in mid-May. This spike in cover was much smaller than that in March, but included small flowered morning glory (*Convolvulus simulans*). Fascicled tarplant (*Deinandra fasciculata*) contributed to native cover in late-spring and early-summer, but cover steadily declined through the end of June. Purple needlegrass and coyote bush (*Baccharis pilularis*) are the only perennial species observed within the NG.

Shortly after the first winter rains, the NG restoration area consisted almost entirely of non-native grasses and patches of fennel (*Foeniculum vulgare*). Fennel was spot-sprayed by HECG and the non-native grasses were treated with a post-emergent herbicide prior to any thread-leaved brodiaea emergence. The herbicide application greatly reduced the non-native grass species cover. Once thread-leaved brodiaea was observed in the restoration area, weed control was limited to hand-weeding within areas containing brodiaea. Portions of the restoration area where brodiaea was absent were treated with herbicide, under the supervision of the restoration specialist. A different set of weed species began to emerge where non-native grass species were reduced. Sow thistle (*Sonchus oleraceus*) and bristly ox-tongue (*Picris echoides*) became abundant during April and May. Wild lettuce (*Lactuca sericia*) became more abundant in June. Mustard (*Brassica* spp.) was not problematic in 2009.

4.2.4 Southern Willow Scrub

Native cover did not change much through the year. Cover did increase in September and October due to supplemental planting. Non-native plant species cover generally remained low throughout the year. The primary non-native species observed has been rabbitsfoot grass (*Polypogon monspeliensis*).

4.2.5 Open Space Areas

Maintenance of open space areas on site was restricted to the grassland open space area (i.e., maintenance of the DCSS open space is not being conducted). Weeding activities in the grassland open space were primarily focused on controlling fennel and mustard. Some efforts were made to begin to control non-native grasses, but HELIX and HECG have reservations about reducing non-native grass cover within the open space (see discussion section below).

An owl box was installed in June 2009 to help control gopher activity in the restoration and open space areas on site. An owl pellet was observed at the base of the owl box in early August. Sign of owl use was not observed for the remainder of 2009.

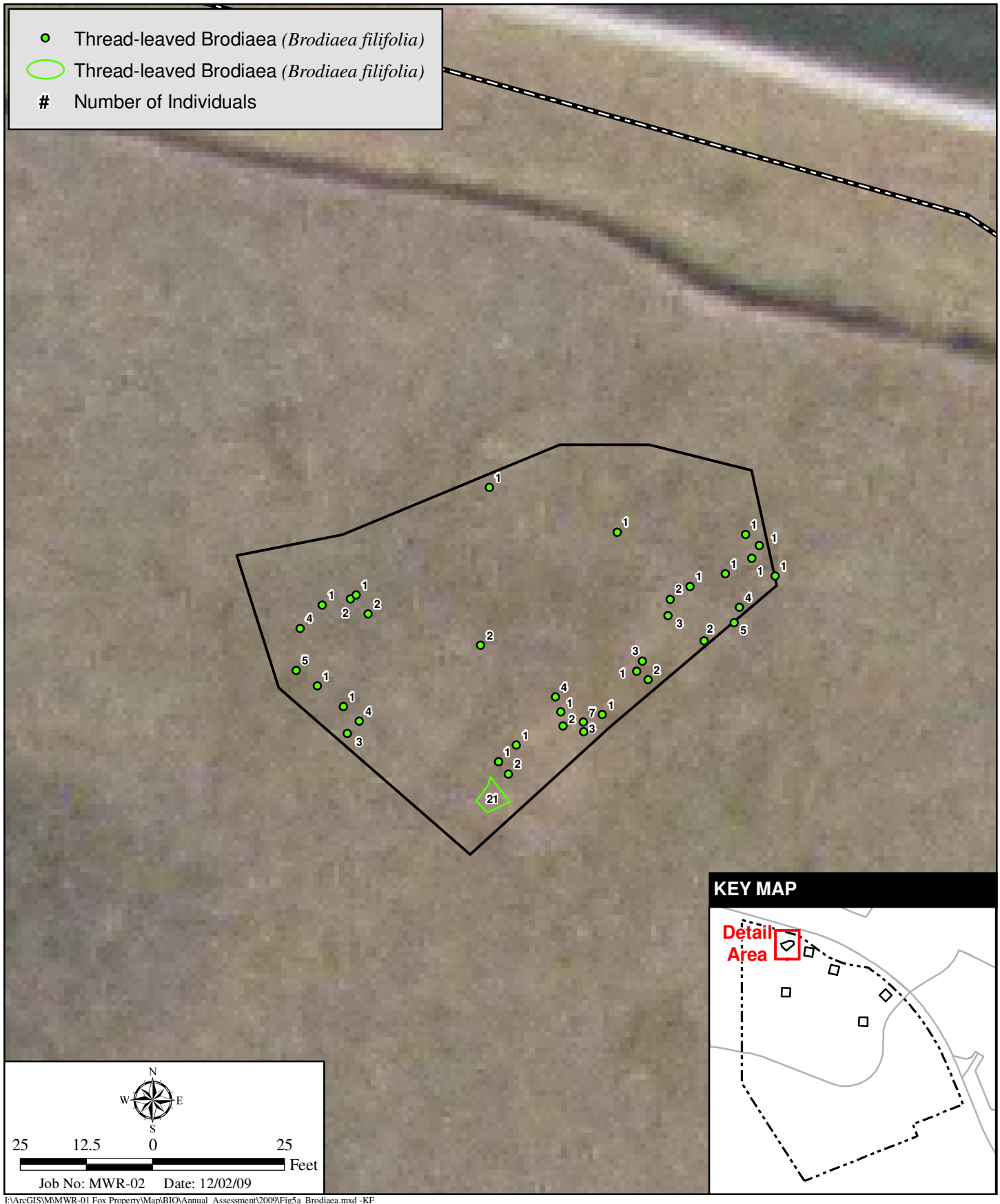
4.3 ANNUAL TECHNICAL MONITORING

This section details the quantitative results of the 2009 annual technical monitoring for thread-leaved brodiaea/DCSS/NG/SWS.

4.3.1 Thread-leaved Brodiaea

Ninety-nine thread-leaved brodiaea individuals were observed in flower within the translocation plot (Graph 1; Figure 5a). Reference plots ranged from a low of 68 flowering individuals to a high of 401 flowering individuals (Graph 1; Figures 5b to 5f). The density of flowering individuals within the translocation plot is similar to most reference plots. The number of flowering individuals within all plots peaked during mid-May (Graph 2). This is consistent with other thread-leaved brodiaea populations HELIX monitored in 2009, which include the Taylor property located in Oceanside and the Rancho Santalina property located in San Marcos.

Both the translocation plot and reference plots had a high density of non-native species. Dominant non-native species include wild oats (*Avena fatua*), Italian rye grass (*Lolium multiflorum*), and false brome (*Brachypodium distachyon*).



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Quantity and Distribution of Flowering Thread-leaved Brodiaea *(Brodiaea filifolia)* Individuals - Translocation Plot

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Figure 5a

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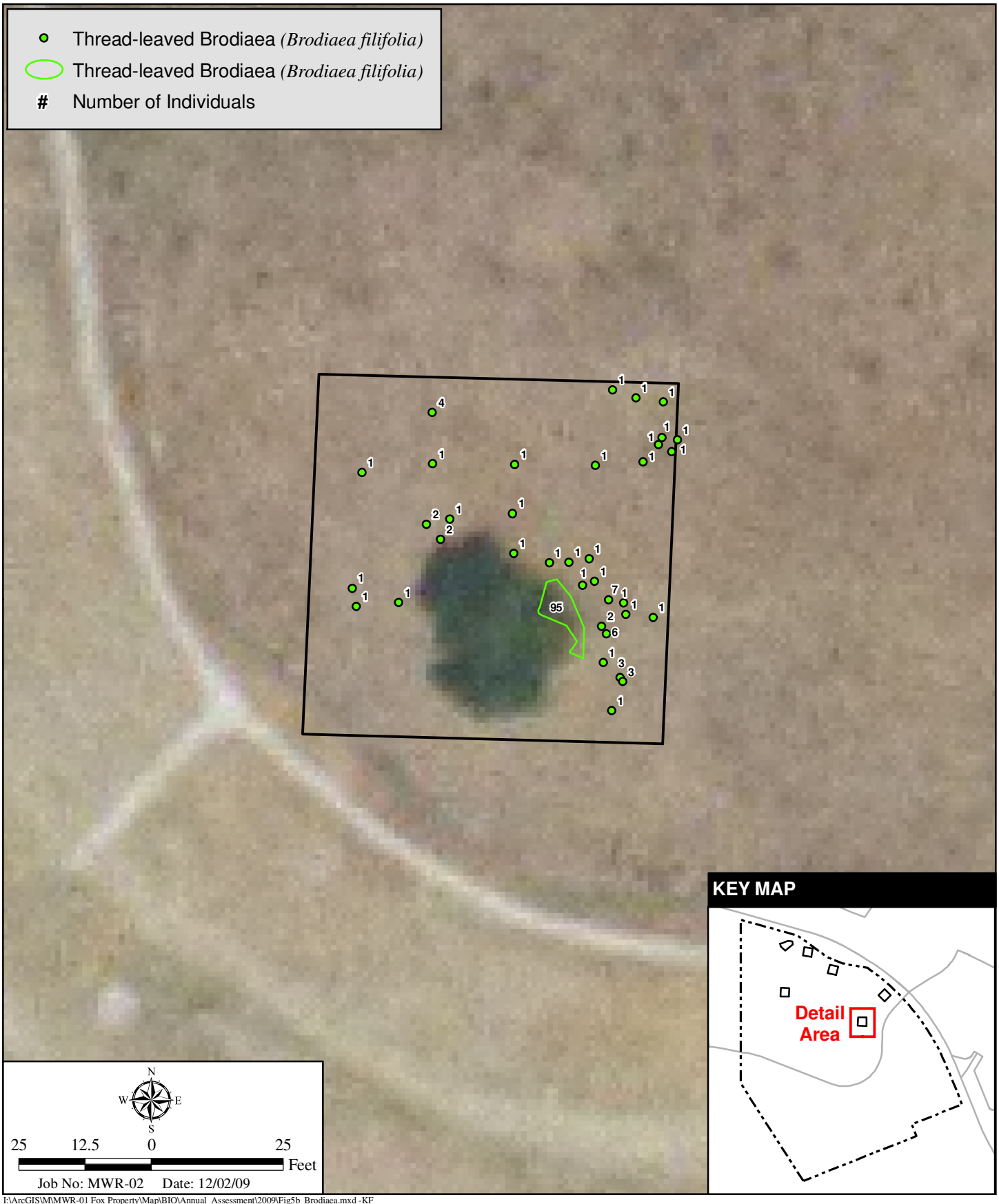

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Quantity and Distribution of Flowering Thread-leaved Brodiaea *(Brodiaea filifolia)* Individuals - Reference Plot A

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Figure 5b

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Quantity and Distribution of Flowering Thread-leaved Brodiaea *(Brodiaea filifolia)* Individuals - Reference Plot B

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Figure 5c

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Quantity and Distribution of Flowering Thread-leaved Brodiaea *(Brodiaea filifolia)* Individuals - Reference Plot C

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Figure 5d

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Quantity and Distribution of Flowering Thread-leaved Brodiaea *(Brodiaea filifolia)* Individuals - Reference Plot D

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Figure 5e

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Quantity and Distribution of Flowering Thread-leaved Brodiaea *(Brodiaea filifolia)* Individuals - Reference Plot E

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Figure 5f

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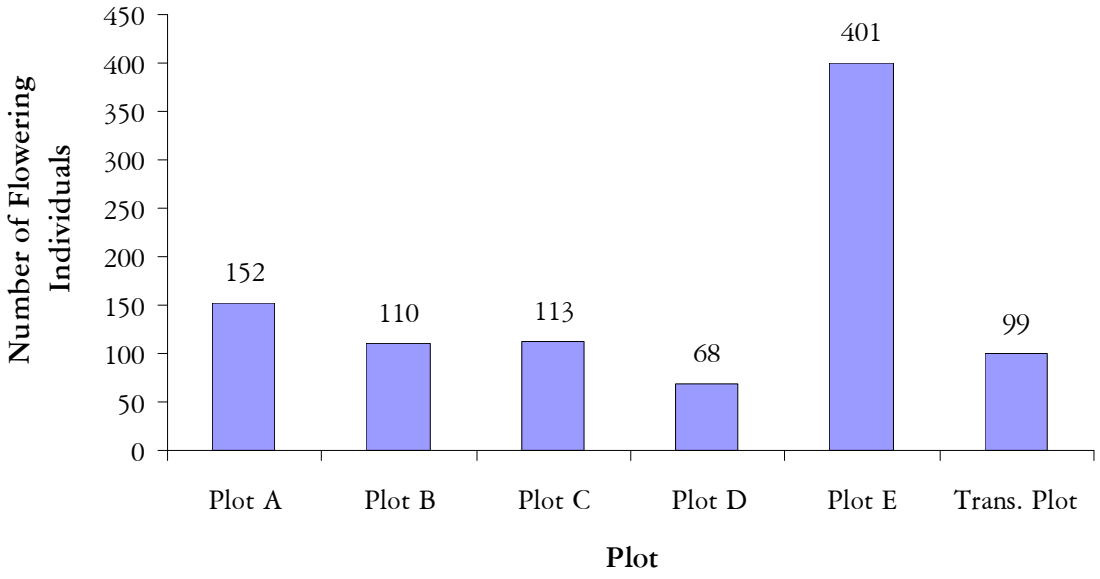
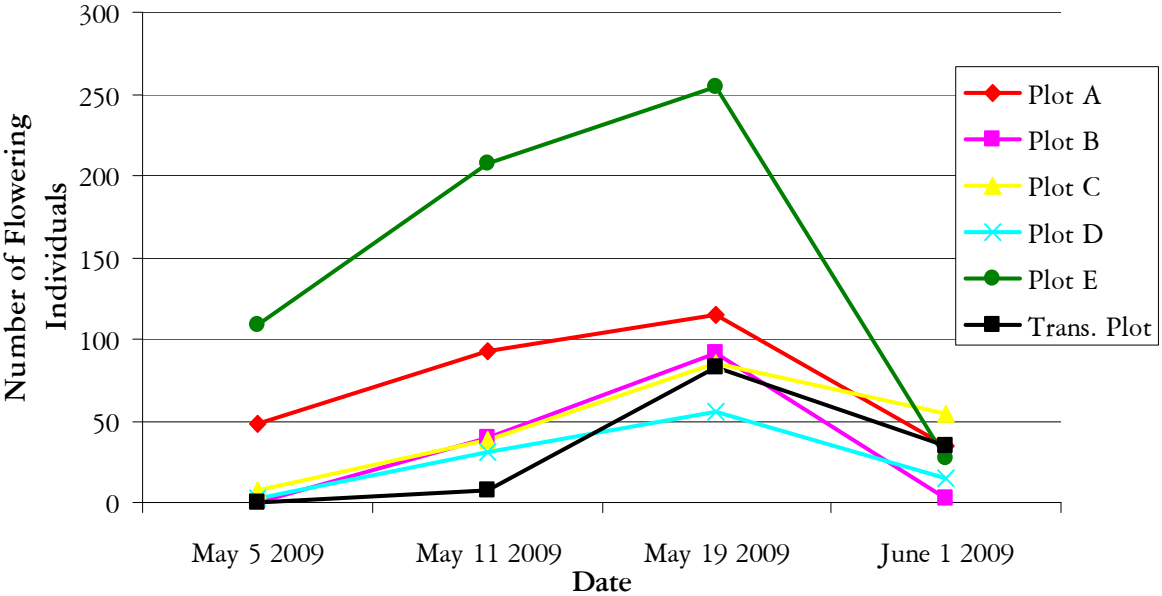
Graph 1
TOTAL NUMBER OF FLOWERING THREAD-LEAVED BRODIAEA INDIVIDUALS PER PLOT



Graph 2
NUMBER OF FLOWERING THREAD-LEAVED BRODIAEA INDIVIDUALS PER PLOT OVER TIME



4.3.2 Diegan Coastal Sage Scrub

In Year 3, the DCSS restoration area had high native species diversity (25 species), moderate native species cover (42 percent), and moderate non-native species cover (23 percent; Table 6). Target weed species (wild oats, Italian rye grass, black mustard [*Brassica nigra*], star thistle [*Centaurea melitensis*], and fennel) were observed within the restoration area at the time of the annual assessment.

Table 6
YEAR 3 RESULTS FOR THE DIEGAN COASTAL SAGE SCRUB RESTORATION AREA

CRITERION	Reference Site	Year 3 Standard	Restoration Area
Species diversity	8	6*	25
Native species cover	90%	36%*	42%
Non-native species cover	20%	5%**	23%
Target weed species cover†	20%	0%**	13%

†Target weed species are those listed on the Cal-IPC list of "Exotic Pest Plants of Greatest Ecological Concern" (2006), with the exception of brome grasses

*Minimum amounts needed to meet Year 3 success criteria

**Maximum percentage allowable to meet Year 3 success criteria

The DCSS restoration area met the success criteria for species diversity and native species cover, but did not meet non-native species cover or target weed cover (Table 6). Non-native species cover and target weed cover were high at the time of the annual assessment because the use of irrigation resulted in the germination of many weed species in the restoration area. Weeds were treated/removed prior to them setting seed.

Species diversity increased greatly over the last year, from 15 species in 2008 to 25 species in 2009. Native species cover remained approximately the same (41 percent in 2008). Non-native species cover decreased from 50 percent in 2008 to 23 percent in 2009. Target weed species cover remained approximately the same (10 percent in 2008).

4.3.3 Native Grassland

In Year 3, the NG restoration area had moderate native species diversity (7 species), low native species cover (2 percent), and high non-native species cover (100 percent; Table 7). Target weed species (primarily grasses [wild oats, Italian rye grass, and purple false brome] with a minimal amount of black mustard and fennel) were observed within the restoration area. Dominant non-native species included purple false brome, wild oats, Italian rye grass, and bristly ox-tounge. Fennel and black mustard occurred in very low densities.

Table 7 YEAR 3 RESULTS FOR THE NATIVE GRASSLAND RESTORATION AREA			
Criterion	**Reference Site**	**Year 3 Standard**	**Restoration Area**
Species diversity	1	1*	7
Native species cover	20%	8%*	3%
Non-native species cover	100%	5%**	79%
Target weed cover†	20%	0%**	67%
Target weed cover (excludes non-native grass species)	20%	0%**	20%

†Target weed species are those listed by the Cal-IPC list of "Exotic Pest Plants of Greatest Ecological Concern" (2006), with the exception of brome grasses

*Minimum amounts needed to meet Year 3 success criteria

**Maximum percentage allowable to meet Year 3 success criteria.

The NG restoration area met the success criteria for species diversity but did not meet native species cover, non-native species cover, or target weed cover (Table 7).

Between 2008 and 2009, species diversity increased from 6 to 7 species, native species cover increased from 2 percent to 3 percent, and non-native species cover decreased from 100 percent to 79 percent. HELIX's 2008 annual report for the site (HELIX 2009) indicated that target weed cover was estimated at 20 percent. However, there was an error in the Year 2 estimate because wild oats and Italian rye grass were not considered when the visual estimate was completed. At a qualitative level, the target weed cover remained approximately the same between Years 2 and 3 due to the prevalence of false brome, wild oats, and Italian ryegrass in the NG restoration area.

4.3.4 Southern Willow Scrub

In Year 3, the SWS restoration area had high native species diversity (17 species), moderately high native species cover (76 percent), and little non-native species cover (0 percent in the transect, less than 5% overall; Table 8). No target weed species were observed within the restoration area. Signs of the clearwing moth (a native species whose larvae boars into willow trees as well other riparian tree species) were observed on some of the arroyo willows.

The reference transect had moderately high native species diversity (11 species), very high native cover (98 percent), and low non-native cover (less than 5 percent along the transect and no target weed species).

Thus, the SWS restoration area met the Year 3 success criteria for diversity, native species cover, non-native species cover, and target weed cover (Table 8). Native cover increased from 45 percent in 2008 to 76 percent in 2009 and diversity has remained very high (19 species in 2008 and 17 species in 2009).

Table 8 YEAR 3 RESULTS FOR THE SOUTHERN WILLOW SCRUB RESTORATION AREA			
Criterion	**Reference Site**	**Year 3 Standard**	**Restoration Area**
Species diversity	11	8	17
Native species cover	98%	74%	76%
Non-native species cover*	< 5%	5%	0%
Target weed cover†	0%	0%	0%

†Target weed species are those listed by the Cal-IPC list of "Exotic Pest Plants of Greatest Ecological Concern" (2006), with the exception of brome grasses

*Maximum percentage allowable to meet Year 3 success criteria.

5.0 DISCUSSION

At the end of 2009 (Year 3), the DCSS/NG/SWS restoration areas are progressing towards their final success criteria. Significant steps were taken over the last year to reduce the amount of non-native cover and to increase the native cover within the restoration areas.

During 2009 the main challenge within the DCSS was to increase native cover. Early in the year, mortality of native species was low, but plants were sparse, growth was minimal, and little to no germination of seed was observed. To bolster native cover, a temporary irrigation system was installed; 1,309 one-gallon container stock were planted between April 30, 2009 and May 14, 2009; and the DCSS slopes were re-seeded in July 2009. Growth of DCSS plants increased and there has been some germination of seed in the restoration area since the irrigation was installed. More germination and growth is expected over the winter (the period when DCSS plants typically germinate and grow in response to seasonal rainfall). The irrigation system will be shut off by December 2009 since the DCSS restoration areas cannot be irrigated for 2 years prior to sign-off. Non-native cover and target weed species cover was high at the time of the annual assessment because the use of irrigation germinated a large number of weed species. Weeds have been regularly maintained throughout the year and weed cover has been maintained at approximately 5 to 10 percent for most of 2009. Germination of native seed and non-native cover will be closely evaluated over the next year. The final success criteria for native cover is 72 percent (80 percent of the reference site's 90 percent cover). Additional planting and/or seeding may be recommended in spring 2010 (if growth and germination are low) or to potentially replace any plants that may have died.

Restoration in the NG has presented a challenge because the on-site distribution of thread-leaved brodiaea (Figure 3) and the duration of when brodiaea is leafing/flowering (i.e., late January through July) has limited the maintenance activities on site. The 2 major issues affecting the NG restoration are (1) the abundance of non-native vegetation and (2) the minimal amount of native plant species cover.

The Restoration Plan for this project sets restrictions on herbicide application within the NG once thread-leaved brodiaea is present. As such, there was a push to treat non-native species in

January 2009 prior to thread-leaved brodiaea emergence. Once brodiaea had emerged, areas with brodiaea were flagged and restoration biologists were on site with field crews to insure herbicide was applied no closer than 10 feet of any thread-leaved brodiaea plant. No herbicide was applied within 10 feet of brodiaea, which greatly limited the area of treatment for the nearly 6 month period when brodiaea was active (January to June). The period when brodiaea is active coincides with the period when non-native grassland species are germinating, growing, and setting seed. Weed management in brodiaea areas (majority of the 4.2-acre NG restoration area [see Figure 4]) was limited to hand-weeding, which proved to be ineffective for controlling non-native grasses. Therefore, hand-weeding was limited to fennel, mustard, and bristly ox-tongue. By the time it was determined safe to use herbicide over the entire NG (July 2009), the non-native grasses had dropped seed.

The project's Restoration Plan states that there can be no greater than 5 percent non-native cover within the NG restoration area, including non-native grasses. This 5 percent threshold for non-native grasses is problematic for several reasons, primary of which is if non-native grass cover were reduced to less than 5 percent, other more problematic weed species would begin to dominate the site, as was seen in 2009. Early herbicide treatments were effective at controlling non-native grass species. In the absence of grasses, other invasive species quickly germinated, including bristly ox-tongue and prickly lettuce. These broadleaf weed species should be considered more of a threat to brodiaea because each plant has a greater surface area and would compete more aggressively with brodiaea for resources (space, light, nutrients, etc). Another reason why the non-native grass threshold is problematic is because planting of native grasses is limited to areas where brodiaea does not occur (Figure 6). Areas where brodiaea occurs have been repeatedly seeded with native grass species. However, because the site cannot be irrigated, germination of native grass seed is heavily dependent on rainfall. The region has been suffering through 3 years of below-average rainfall, which is part of the reason why little native grass seed has germinated on site. HELIX's other thread-leaved brodiaea restoration sites (Rancho Santalina, Taylor Property, La Costa Greens, etc) have not required non-native grass species to be controlled as part of the restoration effort.

HELIX recommends a much higher tolerance for non-native grass species in areas where thread-leaved brodiaea occurs due to the reasons listed above. Focus should be to continue working to eliminate Cal-IPC target species (e.g., mustard, fennel, bristly ox-tongue, etc) and increase native cover. Non-native grasses would be actively managed in areas where thread-leaved brodiaea does not occur and extra effort would be implemented to greatly increase native cover in these areas. HELIX has taken considerable steps to improve native cover within the NG area, but the constraints that brodiaea presents has limited and will continue to limit restoration activities on site. HELIX would like to discuss the weed control recommendations with the resource agencies prior to seasonal rains in order to get approval of the 2010 weeding strategy.

Native cover remained low this year at 3 percent. Data was collected in May, which coincided with the start of the thread-leaved brodiaea blooming period. Given the life history of thread-leaved brodiaea and field observations, vegetation cover would be significantly higher if data was collected earlier in the year. This species requires several years to mature and only a fraction of mature individuals flower (USFWS 2005). In 2009 February and March marked the peak of the vegetation period for thread-leaved brodiaea on site. Visual estimates of this species

during this time of year were around 30 to 40 percent. To increase native grass cover, the NG was seeded January 21, 2009. Focused planting occurred in October 2009 and was confined to 40 flagged polygons (10 feet x 10 feet) within the NG restoration area (Figure 6). Planting areas were located no closer than 10 feet from known thread-leaved brodiaea populations (Figure 6) in order to avoid underground brodiaea corms. Within each 10 foot x 10 foot polygon, native grass (1-gallon container stock) were planted 2 feet on center for a total of approximately 36 plants per polygon. Additional native grass seed will be installed within the NG in early 2010, shortly after the onset of seasonal rains. Additional native grass plantings may also be recommended if native grass seed germination is low, and planting areas would again be restricted to areas outside of known brodiaea locations.

The SWS restoration area is on track to meet Year 5 success criteria. The restoration site currently has high native cover, high species diversity, low non-native cover, and no target weed species. Native cover increased from 45 percent in 2008 to 76 percent in 2009 and diversity has remained very high (19 species in 2008 and 17 species in 2009). Additional planting occurred during 2009 in portions of the SWS area where cover was lower. Additional seeding occurred in order to increase cover by herbaceous species. Results of seeding occurring this year should be evident by spring/early summer of 2010. Non-native species continue to be managed effectively. The irrigation system will be shut off by December 2009 since the DCSS restoration areas cannot be irrigated for 2 years prior to sign-off.

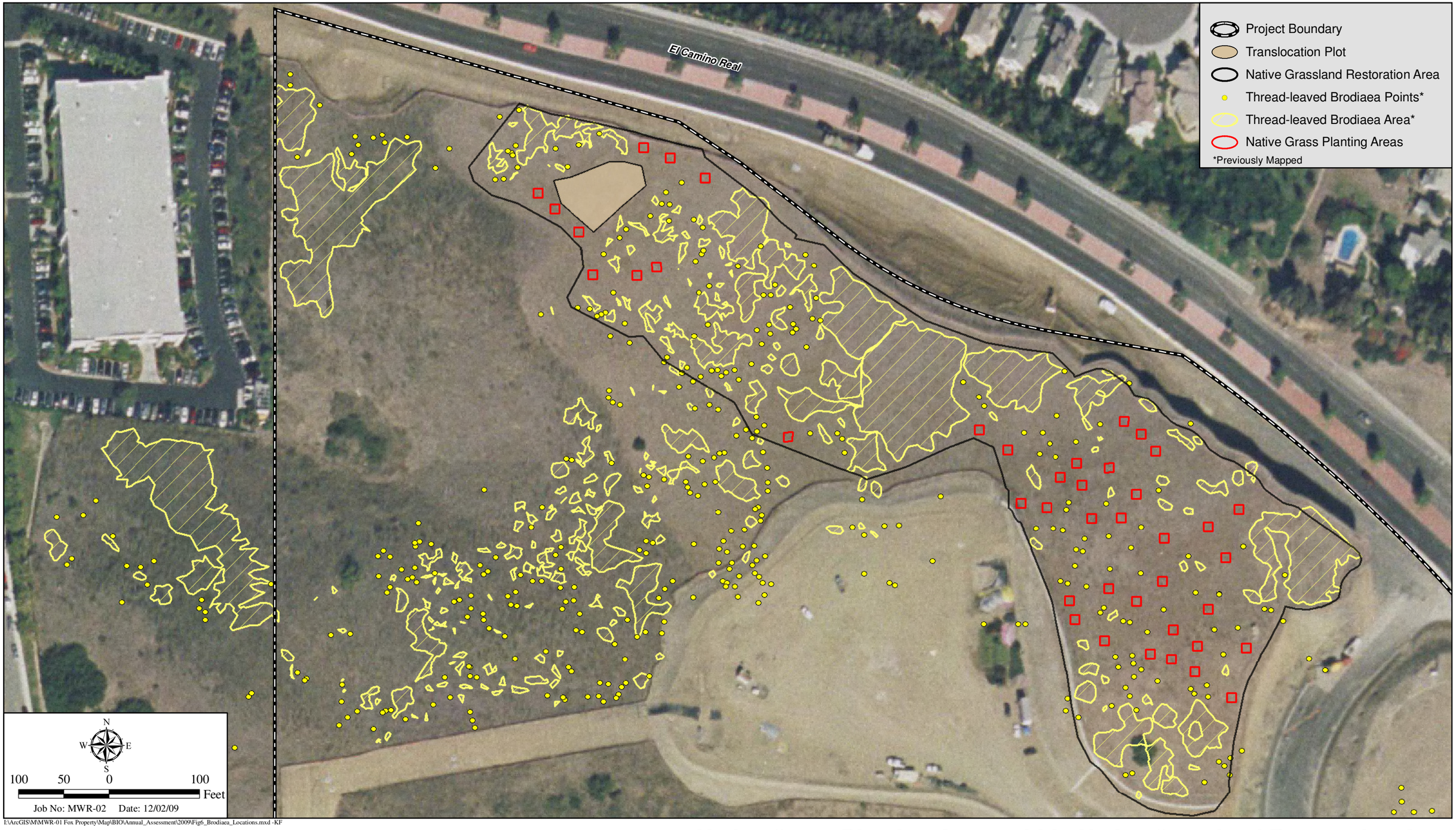
Finally, the thread-leaved brodiaea transplantation plot has met its success criteria for the second straight year. The number of flowering brodiaea individuals within the translocation plot was within the range of reference plots (Graph 1). Continued maintenance of the NG restoration area will help to ensure the thread-leaved brodiaea transplantation effort is successful.

6.0 RECOMMENDATIONS

- Implement weeding strategy in NG restoration area that reduces invasive weed species and allows greater tolerance for non-native grasses. Use post-emergent herbicide during time of year that thread-leaved brodiaea is not active. Weeding activities should continue to be closely coordinated with the restoration specialist.

- Implement plan to maximize germination and cover for NG area. Seed NG with native grass seed mix in early 2010, after the onset of seasonal rains. If seed germination is low due to below-average rainfall or other environmental conditions, selectively plant native grasses (1-gallon container stock) and hand water during establishment. Container stock would be planted no closer than 10 feet from known thread-leaved brodiaea locations.

- Discontinue irrigation of the DCSS slopes and the SWS area in December 2009.



I:\ArcGIS\M\MWR-01 Fox Property\Map\BIO\Annual_Assessment\2009\Fig6_Brodiaea_Locations.mxd -KF

Native Grass Planting Areas within Native Grassland Restoration Area

2009 ANNUAL REPORT FOR THE LOT 5 FOX-MILLER PROPERTY

HELIX

Figure 6

7.0 REFERENCES

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APPENDIX A

REPRESENTATIVE PHOTOGRAPHS

Photo Point 1– southern willow scrub restoration area, looking east.

Photo Point 2 – northern Diegan coastal sage scrub restoration slope, looking north/northeast.

Photo Point 3 – eastern Diegan coastal sage scrub restoration slope, looking south

Photo Point 4 – southern Diegan coastal sage scrub restoration slope, looking south

Photo Point 5 - native grassland restoration area, looking northwest

Photo Point 6 - eastern portion of native grassland restoration area, looking northeast to northwest.

Transect 1 - looking southeast

Transect 2 - looking northwest

Transect 3 - looking southwest

Transect 4 - looking northwest

Transect 5 - looking northwest

Transect 6 - looking southeast

Transect 7 - looking northeast

Transect 8 - looking southwest

Transect 9 - looking northeast

Transect 10 - looking northwest

Transect 11 - looking northwest

Transect 12 - looking northwest

Transect 13 - looking northwest

Representative Photographs

2009 ANNUAL ASSESSMENT FOR THE LOT 5 FOX-MILLER PROPERTY

APPENDIX B

PLANT SPECIES OBSERVED

Appendix B
PLANT SPECIES OBSERVED – LOT 5 FOX-MILLER PROPERTY

NATIVE GRASSLAND

Scientific Name	Common Name
*Anagallis arvensis**	scarlet pimpernel
*Avena fatua**	wild oats
Baccharis pilularis	coyote bush
*Brachypodium distachyon**	false brome
*Brassica nigra**	black mustard
Brodiaea filifolia	thread-leaved brodiaea
*Bromus diandrus**	ripgut brome
*Bromus hordeaceus**	soft chess
Bromus madritensis ssp. *rubens**	red brome
*Carduus pycnocephalus**	Italian thistle
Clarkia purpurea	purple clarkia
Convolvulus simulans	small flower morning glory
Diclostema capitatum	bluedicks
*Foeniculum vulgare**	fennel
*Gastridium ventricosum**	nit grass
*Hedypnois cretica**	crete weed
*Lactuca sericia**	wild lettuce
*Lolium multiflorum**	Italian rye grass
Nassella pulchra	purple needlegrass
Phalaris sp.*	canarygrass
*Picris echoides**	bristly ox-tounge
Sisyrinchium bellum	blue eyed grass
*Sonchus asper**	prickly sow thistle
*Sonchus oleraceus**	sow thistle

DIEGAN COASTAL SAGE SCRUB

Scientific Name	Common Name
Adolphia californica	California adolphia
*Anagallis arvensis**	scarlet pimpernel
Artemisia californica	California sagebrush
*Avena fatua**	wild oats
Baccharis pilularis	coyote bush
Baccharis salicifolia	mule fat
Bloomeria crocea	common goldenstar
*Brachypodium distachyon**	false brome

Appendix B (cont.)
PLANT SPECIES OBSERVED – LOT 5 FOX-MILLER PROPERTY

DIEGAN COASTAL SAGE SCRUB (cont.)

Scientific Name	**Common Name**
*Bromus diandrus**	ripgut brome
*Bromus hordeaceus**	soft chess
Bromus madritensis ssp. *rubens**	red brome
*Brassica nigra**	black mustard
Brickellia californica	California brickellbush
*Centaurea melitensis**	star thistle
Conyza sp.	horseweed
Diclostema capitatum	bluedicks
Encelia californica	California encelia
*Foeniculum vulgare**	fennel
Hazardia squarrosa	saw toothed Goldenbush
Heteromeles arbutifolia	toyon
Heterotheca grandiflora	telegraph weed
Hesperoyucca whipplei	chaparral yucca
Isomeris arborea	bladderpod
*Lactuca sericia**	wild lettuce
*Lolium multiflorum**	Italian rye grass
Malosma laurina	laurel sumac
*Mirabilis jalapa**	wishbone bush
Muhlenbergia microsperma	littleseed muhly
Muhlenbergia rigens	deergrass
Nassella pulchra	purple needlegrass
Opuntia littoralis	coast prickly pear
Phalaris sp.*	canarygrass
*Picris echoides**	bristly ox-tounge
Rhus integrifolia	lemonade berry
Salvia apiana	white sage
Salvia mellifera	black sage
Sambucus mexicana	Mexican elderberry
Sisyrinchium bellum	blue eyed grass
Solanum sp.	nightshade
*Sonchus oleraceus**	sow thistle

Appendix B (cont.)
PLANT SPECIES OBSERVED – LOT 5 FOX-MILLER PROPERTY

SOUTHERN WILLOW SCRUB

Scientific Name	**Common Name**
Alyssum sp.*	alyssum
Artemisia californica	California sagebrush
Artemisia douglasiana	California mugwort
Baccharis pilularis	coyote bush
Baccharis salicifolia	mule fat
Distichlis spicata	salt grass
Iva hayesiana	San Diego marsh elder
Juncus acutus	spiny rush
Leymus condensatus	giant wildrye
Leymus triticoides	creeping wild rye
*Picris echioides**	bristly oxtounge
Pluchea odorata	marsh fleabane
*Polypogon monspeliensis**	rabbitsfoot grass
Platanus racemosa	Western sycamore
Rhus trilobata	squabush
Salix exigua	sandbar willow
Salix gooddingii	black willow
Salix lasiolepis	arroyo willow
Salvia mellifera	black sage
Sambucus mexicana	blue elderberry
*Sonchus oleraceus**	sow thistle

*Non-native species

APPENDIX C

ANIMAL SPECIES OBSERVED WITHIN THE VARIOUS RESTORATION AREAS

Appendix C
ANIMAL SPECIES OBSERVED WITHIN THE VARIOUS RESTORATION AREAS
LOT 5 FOX-MILLER PROPERTY

Scientific Name	Common Name	Vegetation Community*
VERTEBRATES		
Birds		
Buteo lineatus	red-shouldered hawk	NG
Calypte anna	Anna's hummingbird	DCSS, NG
Carduelis psaltria	lesser goldfinch	DCSS, NG, SWS
Carpodacus mexicanus	house finch	DCSS, NG, SWS
Chamaea fasciata	wrentit	DCSS
Charadrius vociferus	killdeer	DCSS, SWS
Corvus brachyrhynchos	American crow	DCSS, NG, SWS
Corvus corax	common raven	DCSS, NG, SWS
Geothlypis trichas	common yellowthroat	SWS
Melospiza melodia	song sparrow	DCSS, NG, SWS
Pipilo crissalis	California towhee	DCSS
Polioptila californica californica	coastal California gnatcatcher	DCSS
Sayornis nigricans	black phoebe	NG
Sayornis saya	Say's phoebe	DCSS, NG
Stegidoptreyx serripennis	Northern rough-winged swallow	DCSS, NG, SWS
Sturnus vulgaris	European starling	DCSS, NG, SWS
Tyrannus vociferans	Cassin's kingbird	DCSS, NG
Zenaida macroura	mourning dove	DCSS, NG, SWS
Reptile		
Crotalus viridis	Southern Pacific Rattlesnake	NG
Mammals		
Canis latrans	coyote	NG
Sylvilagus audubonii	desert cottontail	DCSS, NG
Thomomys bottae	Botta's pocket gopher	DCSS, NG

*DCSS = Diegan coastal sage scrub, NG = native grassland, and SWS = southern willow scrub